NOTES ON NORTH AMERICAN TREES. IV

C. S. Sargent

Picea glauca (Moench) Voss, Mitt. Deutsch. Dendr. Ges. **16**:93. 1907.—Although *Abies canadensis* Miller is the oldest name for the white spruce, *Picea glauca*, according to the rules of the Vienna Congress, must be adopted for this tree, for there is a *Picea canadensis*, which is a valid name for the hemlock spruce under the genus *Picea*. The Rocky Mountain variety then becomes

Picea glauca var. **albertiana**, n. comb.—*Picea canadensis* var. *albertiana* Rehder, Mitt. Deutsch. Dendr. Ges. **24**:213. 1916.

Juniperus utahensis var. **megalocarpa**, n. var.—*Juniperus megalocarpa* Sudworth, Forestry and Irrigation **13**:307. *figs. 1* and *2*. 1907; Wooton and Standley, Contrib. U.S. Nat. Herb. **19**:37. 1915.—*Sabina megalocarpa* Cockerell, Muhlenbergia **3**:143. 1907. —Differing from the type in its larger fruit sometimes 1.7 cm. in diameter, and in its habit of sometimes forming a single erect stem.

A tree 10–14 m. high, with a straight trunk occasionally 1–1.2 m. in diameter.

Valley of the San Francisco River near Alma, southwestern New Mexico, *W. R. Mattoon*, September 1906, *Alfred Rehder*, August 13 and 14, 1914 (nos. 285, 285b, 289); Arizona: rim of the Grand Canyon, *C. S. Sargent*, September 9, 1904; Angel, near Flagstaff, *Percival Lowell*, September 4, 1910.

Mr. Rehder visited the type station of this tree in New Mexico in August 1914 and obtained a large amount of material which shows that it must be considered a variety of *J. utahensis*, for he found trees with fruit intermediate in size between that of the typical *J. utahensis* (6–7 mm. in diameter) and the largest fruits of *J. megalocarpa*, that the trees with single stems did not always produce large fruit, and that the large-fruited trees sometimes had the characteristic habit of *J. utahensis*. Like that of *J. utahensis*, the fruit of the variety ripens at the end of the second season. A specimen of *J. utahensis* in the herbarium of the Arboretum collected by *E. Bethel* at Radium, Colorado, in November 1908 at an elevation of 2300 m., has fruit 1.3 cm. in diameter and should perhaps be referred to the variety.

Populus tremuloides var. **vancouveriana**, n. var.—*Populus vancouveriana* Trelease apud Tidestrom in Piper and Beattie, Fl.

Northwest Coast, 118. 1915.—Differing from the type in its thicker, more coarsely serrate leaves, densely hoary tomentose below when they unfold, villose aments, and in its pubescent or puberulous branchlets and tomentose winter-buds. Leaves broadly ovate to semiorbicular, rounded or slightly cordate at broad base, abruptly short-pointed or rounded at apex, coarsely crenately serrate and sometimes obscurely crispate on the margins, when they unfold covered below and on the petioles with a thick coat of long matted pale hairs and slightly villose above, soon glabrous, and at maturity thick, dark green, lustrous, and scabrate on the upper surface, paler on the lower surface, 8–11 cm. long and broad, with prominent midribs and primary veins; petioles slender, compressed, becoming glabrous, 5–8 cm. in length. Rachis of the staminate inflorescence slightly villose, the pedicels pubescent; disk of the flower puberulous toward the base, flowers otherwise as in the species. Pistillate inflorescence 5–6 mm. long, the rachis, pedicels, and slightly lobed disk of the flower densely villose, becoming pubescent or glabrous on the fruit; ovary conic, pubescent, with a short style, and stigmas divided into narrow divergent lobes. Fruiting aments 8–9 cm. long, the fruit oblong-conical, pubescent or glabrous, 5 mm. long; pedicels not more than 1 mm. in length.

A tree 10–12 m. tall, with a trunk 30–40 cm. in diameter, stout spreading branches forming a round topped head, stout, reddish brown pubescent or puberulous branchlets often becoming glabrous during their first summer, and acute tomentose pubescent or glabrous winter-buds.

Borders of salt marshes on the coast of Vancouver Island, British Columbia, near Sidney, *J. Macoun*, May 3, 1913 (staminate flowers), May 13, 1913 (pistillate flowers), June 13, 1913, April 1914 (pistillate flowers), April 13, 1914 (fruit), May 6, 1914, *C. S. Sargent*, July 27, 1913; by shingle mill near Sidney, *J. Macoun*, April 2, 1913; old brickyard, Sidney, June 22, 1914; near Victoria, British Columbia, *Engelmann* and *Sargent*, August 19, 1880, *J. Macoun*, August 21, 1893 (no. 2131), May 27 and August 31, 1893 (no. 2232), May 28, 1908 (nos. 85714, 8805a), June 4, 1908 (no. 88059), May 5, 1915; Dead Man's Creek, near Victoria, *J. Macoun*, July 23, 1908; Esquimo, Vancouver Island, *J. Macoun*, June 23, 1887; Cape Laza, near Comox, Vancouver Island, *J. Macoun*, July 7, 1915.

Extreme forms of this tree certainly appear distinct from *P. tremuloides* Michaux and its western variety *aurea* Daniels, but the shape of the leaves is not constant; the branchlets and the young leaves are sometimes glabrous or nearly glabrous; on some branches the winter-buds are not tomentose but are

pubescent or glabrous; and the only constant character I can find in the Vancouver Island trees is the presence of the dense covering of hairs on the rachis of the male and female inflorescence and on the disk of the pistillate flower.

Populus arizonica, n. nom.—*Populus mexicana* Sargent, Silva N. Am. 14:73. *pl. 733* (not Wesmael). 1902; Man. 162. *fig. 136.* 1905.—A photograph of the type specimen of *P. mexicana* Wesmael collected by *Berlandier* between Tampico and Rial del Monte in May 1827, kindly sent to the Arboretum by the late CASIMIR DECANDOLLE, shows clearly that the tree with small fruit which is common in the neighborhood of Tucson, Arizona, was wrongly referred to WESMAEL'S species. For the Arizona tree I now suggest the name of *P. arizonica.* It is well distinguished from the other cottonwoods of the United States by the small fruit, which does not exceed 5 mm. in length.

ARIZONA.—Common up to 2200 m. above sea level. Santa Catalina Mountains, Pima County, *C. G. Pringle*, 1881, *A. Rehder*, August 8, 1914 (no. 256); Bear Creek, foot of Santa Catalina Mountains, *A. Rehder*, August 30, 1916 (no. 452); Sabino Canyon, Santa Catalina Mountains, *J. W. Toumey*, February 20, 1894, *A. Rehder*, August 7, 1914 (no. 233), September 1, 1916 (no. 500); near Tucson, Pima County, *Engelmann* and *Sargent*, September 30, 1880, *J. W. Toumey*, February 27, 1894, February 1898, *C. S. Sargent*, February 27, 1894, March 27, 1916; Douglas, Cochise County, *A. Rehder*, August 27, 1916 (no. 447a, a planted street tree); Yavapai County, near Clarkdale, *A. Rehder*, September 11, 1916 (no. 555), near Camp Verde, September 9, 1916 (no. 542), Beaver Creek, near Camp Verde, September 8, 1916 (no. 540), banks of Gannett Creek, Prescott, September 4, 1916; on Salt River, near the Roosevelt Dam, Gila County, *W. H. Goddard*, June 1917; Coconino County, Sycamore Canyon, *Percival Lowell*, September 1915, *A. Rehder*, September 14, 1916 (no. 573); Hermit Creek, Grand Canyon of the Colorado, *Alice Eastwood*, April 10, 1917 (no. 6002); Turkey Creek, near Flagstaff, *C. O. Lampland*, March 1917; Canyon Diablo, *C. O. Lampland*, April 5, 1915 (these specimens have only very young flower buds and may belong to another species).

CALIFORNIA.—A sterile branch collected by *A. Rehder* July 23, 1914 (no. 128), on Mill Creek above Forest Home, San Bernardino Mountains, is doubtfully referred to this species.

NEW MEXICO.—Near Silver City, Grant County, *E. L. Greene*, 1880 (distributed as *P. Fremontii*), *O. F. Arthur*, March 16, 1918, *M. W. Talbot*, April 1, 1918, *J. A. Scott*, May 18, 1918.

In the neighborhood of Tucson, where this poplar has been planted in considerable numbers, it is a magnificent tree 20–28 m. in height with a trunk

sometimes 1 m. in diameter, a broad head of wide spreading branches, slender branchlets, glabrous or puberulous, and lustrous yellow-green leaves often puberulous early in the season. The bark of the branches and young stems is nearly white and on old trunks it is pale green and slightly divided into broad flat ridges.

POPULUS ARIZONICA var. **Jonesii,** n. var.—Differing from the type in the pubescent, not puberulous, young leaves, petioles, and young branchlets.

Mexico, Valley of Palms, *Marcus E. Jones*, April 8, 1882 (no. 373, type); valley near Chihuahua, *C. G. Pringle*, March 31, 1886 (no. 885); Saltillo, *C. G. Pringle*, June 4, 1888 (no. 2098, with larger leaves and more pubescent branchlets), *C. S. Sargent*, March 1887 (a very large tree with pendulous branches); Valley of Mexico, *C. G. Pringle*, February 13, 1899 (no. 8019); Pedras Negras, *C. S. Sargent*, March 21, 1900 (a planted tree).

Populus Palmeri, n. sp.—Leaves thin, ovate, cuneate or rounded at the broad base, gradually or abruptly contracted at apex into a narrow acuminate entire point, finely serrate with incurved teeth, ciliate on the margins when they unfold, otherwise glabrous, 6–10 cm. long and 4.5–8 cm. wide; petioles slender, glabrous, 3.5–6 cm. in length. Flowers not seen. Fruit in slender glabrous aments 12–15 cm. long, ovate, obtuse, slightly pitted, puberulous, thin-walled, 4-valved, 6–7 mm. long, the disk deeply lobed, 4–5 mm. in diameter; pedicels slender, 7–9 mm. in length.

A tree 20–21 m. tall with a straight trunk 1 m. in diameter, erect, smooth, pale branches forming an open pyramidal head, the lower branches smaller, horizontal or pendulous, and slender, glabrous branchlets light reddish brown early in the season, becoming pale grayish brown in their second year. Bark pale, 5 cm. thick, deeply divided by wide fissures into narrow ridges.

In most fertile soil near springs, at the base of high chalk bluffs of Nueces Canyon of the upper Nueces River, Uvalde County, Texas, growing with *Salix nigra* var. *Lindheimerii*, *Carya pecan*, *Morus rubra*, and *Ulmus crassifolia*, *E. J. Palmer*, April 11 and September 1918 (nos. 13340, 14511).

In the shape of the leaves and their serration, in the small fruit, and in the remarkably slender branchlets this poplar is so different from all other American species that, although it is still very imperfectly known, I venture to describe it. It is the only species seen by PALMER in Uvalde County.

Populus texana, n. sp.—Leaves thin, glabrous, broadly ovate, truncate at base, gradually narrowed, long-pointed, acuminate at apex, coarsely crenately serrate below the middle, entire above,

7–8 cm. long and 6–7 cm. wide; petioles slender, compressed, 4–7 cm. in length. Flowers not seen. Fruit in slender, glabrous aments 7–8 cm. long, oblong-ovate, acute, deeply pitted, glabrous, thin-walled, 3-valved, 8–9 mm. long, the disk slightly lobed, 2.5–3 mm. in diameter; pedicels slender, 3–4 cm. in length. Seeds ovate, acuminate, 4 mm. long.

A tree up to 20 m. high, with a trunk sometimes 1 m. in diameter, and stout more or less pendulous branches, stout, glabrous, pale yellow-brown branchlets, and acuminate, glabrous winter-buds.

In canyons and along the streams of northwestern Texas, where it appears to be the only cottonwood. Low sandy banks of the Canadian River, Canadian, Hemphill County, *E. J. Palmer*, June 17, 1918 (no. 14107); creek banks, Amarillo, Potter County, *E. J. Palmer*, July 13, 1917 (no. 12541); canyon, Paloduro Creek, Randall County, *E. J. Palmer*, October 3, 1918 (no. 14591); river banks in canyon, Gamble's Ranch, Armstrong County, June 6, 1918 (no. 13959). "One of the largest trees found in Paloduro Canyon, growing in the protection of high bluffs. It usually grows in the protection of high bluffs or at the heads of canyons. The young trees here are slender and straight, but older specimens are very irregular or unsymmetrical in growth, with pale or dark ashy bark. It is rarely found in the more open parts of the canyon here, but near Canyon City it grows on the river margins" (E. J. P. in litt.); Post, Garza County, *E. J. Palmer*, May 31, October 1, 1918 (nos. 13848, 13853, 14575); along creeks, Sweet Water, Nolan County, *E. J. Palmer*, October 21, 1917, May 28, September 28, 1918 (nos. 13045, 13799 type, 13899, 14526).

By the shape of the leaves and by the thickness and color of the branchlets this species cannot be distinguished from *P. Wislizenii* Sargent, but from that species it is well distinguished by the smaller fruit on much shorter pedicels and by the glabrous winter-buds. The range of the two trees is also quite different.

Populus Macdougallii Rose, Smithsonian Misc. Coll. 61:61. 1913.—This species, of which I have not seen the flowers, is well distinguished from *P. Fremontii* by the minute disk of the fruit, which does not exceed 3 mm. in diameter. The fruit is borne on slender, glabrous pedicels 3–5 mm. in length, in racemes 5–6 cm. long; it is ovate and acute at apex to ellipsoidal and acute or acuminate at ends, glabrous, slightly pitted, thin-walled, 3-valved, 10–12 mm. in length. The seed is oblong-ovate, acuminate, 3 mm. in length.

It is probably always a small tree with erect branches and slender branchlets pubescent or puberulous when they first appear, soon becoming glabrous and pale yellow-brown at the end of their first season.

This is the common and probably the only cottonwood of the valley of the lower Colorado River. It is common on both banks of the river at Yuma, and is planted in some of the towns of the Colorado Desert region like Yuma, Mecca, and Indio. It has also been planted at the Needles on the Colorado River in San Bernardino County, California.

Populus Fremontii S. Watson.—This is the common and only cottonwood of the valleys of northern and central California west of the Sierra Nevada. The leaves are slightly cordate at the broad base and coarsely serrate often with few teeth. The fruit is ovate with a disk about 5 mm. in diameter, on pedicels 3–5 mm. in length.

In San Bernardino County, California, Nevada, Utah, and Arizona poplar trees occur which, although the disk of the fruit is smaller or larger than that of the typical *P. Fremontii*, until better known are best considered perhaps varieties of that species. Three of these forms may be distinguished as follows:

Populus Fremontii var. **Thornberii,** n. var.—Leaves broadly ovate, abruptly contracted into acuminate points, slightly cordate at the wide base, coarsely crenately serrate with numerous teeth, glabrous, 6–8 cm. long and broad; petioles 3.5–4 cm. in length. Flowers not seen. Fruiting aments 5–6 cm. long, the capsules ellipsoidal, 3-valved, deeply pitted, 8–9 mm. long; disk 3 mm. in diameter; pedicels 2–3 mm. in length.

A large tree with pale deeply furrowed bark and pale gray glabrous branchlets.

Low ground near Tucson, Pima County, Arizona, *C. S. Sargent*, March 27, 1916.

From the typical *P. Fremontii* this variety differs in the more numerous serratures of the leaves, in the ellipsoidal, not ovate, fruit with a smaller disk, and in the much shorter pedicels. This tree was shown to me by Professor J. J. Thornber of the University of Arizona, whose name I venture to associate with it.

Populus Fremontii var. **pubescens,** n. var.—Differing from the type in its more pubescent branchlets.

This is a common tree in San Bernardino and San Diego counties, California, and extends into Nevada and southern Utah. The branchlets of the type specimen of *P. Fremontii*, which was collected by *Fremont* in the upper Sacramento Valley, are described as slightly pubescent, but on the other specimens of this tree which I have seen from California north of San Bernardino County they are glabrous, and as the range of the trees with the

distinctly pubescent branchlets extends far beyond the region occupied by typical *P. Fremontii* it will perhaps be best to consider that they represent a geographical variety. I have seen the following specimens:

CALIFORNIA.—San Bernardino Mountains, *G. R. Vasey*, 1880; San Bernardino, *C. C. Parry*, April 1883, *C. S. Sargent*, March 30, 1916; Barstow, San Bernardino County, *W. L. Jepson*, May 1914 (no. 5894), March 8 and 22, 1916 (nos. 6610, 6611, 6626); Warner Hot Springs, San Diego County, *Alice Eastwood*, April 9, 1913 (no. 2619); Bernardo, San Diego County, *Le Roy Abrams*, May 2, 1903 (no. 33701).

NEVADA.—"Kiernan, Meadow Valley, Wash.," *L. N. Goodding*, April 28, 1902 (no. 634); south base of Mount Grant, Mineral County, *A. A. Heller*, July 2, 1913 (no. 10909).

UTAH.—St. George, Washington County, *M. E. Jones*, March 30, 1880 (no. 1611).

POPULUS FREMONTII var. **Toumeyi**, n. var.—Differing from the type in the cordate-cuneate broad base of the leaves, and in the larger disk of the fruit. Leaves ovate, the base shallow cordate and gradually narrowed and cuneate to the insertion of the petiole, gradually narrowed and acuminate at the entire apex, coarsely and irregularly crenately serrate below, glabrous, 6–7 cm. long and broad. Fruit oblong-ovoid to slightly obovoid, acute or obtuse at apex, 8–10 mm. long, the disk 6–7 mm. in diameter; pedicels 4–5 mm. in length.

ARIZONA.—Tucson, Pima County, *J. W. Toumey*, April 28, 1894 (type); Pima Canyon, Santa Catalina Mountains, Pima County, *J. J. Thornber*, March 2, 1913; Santa Cruz River bottoms, Pima County, *J. J. Thornber*, March 30, 1913; Nogales, Santa Cruz County, *McPherson*, April 15, 1915; Hermit Creek, Grand Canyon of the Colorado, Coconino County, *Alice Eastwood*, April 10, 1917 (no. 6002).

Populus Parryi, n. hyb. (*P. Fremontii*×*trichocarpa*).—Leaves ovate, rounded or slightly cordate at the broad entire base, gradually narrowed, acuminate and entire at apex, finely crenately serrate below, sparingly villose and ciliate on the margins when they unfold, soon glabrous, and at maturity thin, dark green, and lustrous above, silvery white below, 6–8 cm. long and broad; petioles slender, slightly compressed, glabrous, 4–6 cm. in length; leaves on vigorous shoots sometimes oblong-ovate, truncate or rounded at base, acute at apex, more coarsely serrate, 9–12 cm. long and 8–10 cm. wide, with stout compressed petioles 3–4 cm. in length.

Staminate aments densely flowered, 5–6 cm. long, puberulous, the bract of the flower broadly obovate, laciniate; anthers 10 or 12; aments of pistillate flowers villose, 6–7 cm. long, becoming at maturity 15–16 cm. in length. Disk of the flower broad, entire or erose on the margin; ovary broad, ovate, puberulous; stigma 3-lobed or occasionally 2-lobed. Fruit broadly ovate, rounded at apex, slightly pitted, puberulous, thin-walled, inclosed sometimes for one-third of its length in the enlarged disk, 5–6 mm. long, often abortive; pedicels puberulous, 2–2.5 mm. in length; seeds narrow-obovoid to ellipsoidal, 3 mm. long.

A large tree with deeply furrowed bark, wide spreading branches, slender glabrous branchlets reddish brown in their first season, light orange-brown in their second year, and acuminate, lustrous, glabrous winter-buds.

Streets of San Bernardino, San Bernardino County, California, *C. C. Parry*, March and April 1883 (type), *C. S. Sargent*, March 16, 1916, *S. B. Parish*, October 15, 1917; along Cottonwood Creek, west side of Owen's Lake, Inyo County, California, *F. V. Coville* and *F. Funston*, June 19, 1881 (no. 996); in the Canoda de las Uvas, about 2 miles north of Fort Tjon, Kern County, California, *F. V. Coville* and *F. Funston*, July 5, 1891 (no. 1163).

These trees appear intermediate in character between *P. Fremontii* and *P. trichocarpa*. The leaves resemble in shape those of the common Californian form of *P. Fremontii*, but are silvery white below like those of *P. trichocarpa* and the other balsam poplars, and their serration is much finer than that of the leaves of *P. Fremontii*, but coarser than that of the leaves of *P. trichocarpa*. The staminate flowers have fewer stamens than those of either of the supposed parents; the disk of the female flowers is very similar to that of both of them, but the ovary, which is glabrous in *P. Fremontii* and densely tomentose in *P. trichocarpa*, is pubescent. PARRY, who first noticed this tree and who would have considered it a new species if he had seen it growing wild, thought that it might have been an exotic species introduced into San Bernardino. The leaves on the specimens of the wild plants from the western base of the Sierra Nevada are similar to those of the San Bernardino trees, but the fruit is rather longer and more acute. Of these specimens COVILLE wrote me November 4, 1892: "I send you by mail specimens of a poplar collected along streams flowing from the southern Sierra Nevada. Specimens of *P. Fremontii*, *P. tremuloides*, and *P. trichocarpa* were collected by the Expedition (Death Valley), and these specimens show characters between *P. Fremontii* and *P. trichocarpa*."

OSTRYA VIRGINIANA K. Koch.—The variety of this tree, on which the branchlets, petioles, and peduncles are covered with short erect glandular hairs, may be distinguished as

OSTRYA VIRGINIANA var. **glandulosa,** n. comb.—*Ostrya virginiana* var. *glandulosa* Spach, Ann. Sci. Nat. II. **16**:246. 1841.

From Quebec and Ontario to southwestern New England and western New York, and in eastern Michigan this is the prevailing variety. The two forms occur in New Jersey, Pennsylvania, Indiana, northern Illinois, southwestern Missouri, Oklahoma, and on the high Appalachian Mountains.

Betula Eastwoodae, n. sp.—Leaves broad-ovate to elliptic, crenately serrate except at the cuneate base, thick, glabrous, dark green above, pale below, rather conspicuously reticulate venulose especially on the upper side, 2.5–3 cm. long and 1.6–2.3 cm. wide; petioles slender, glabrous, often tinged with red, 5–7 mm. in length. Staminate catkins usually solitary or in pairs, sessile, 2–3 cm. long, 5 mm. in diameter, their scales broadly ovate, acute and apiculate at apex, pubescent, dark red. Pistillate catkins pendulous on peduncles 8–10 mm. long, cylindric, 1.5–2 cm. in length, 6–7 mm. in diameter, their scales longer than broad, the lobes rounded at the narrow apex, ciliate, the lateral slightly spreading, one-third shorter than the terminal lobe.

A tree rarely more than 6–7 m. tall with a trunk not more than 15 cm. in diameter, covered with close chestnut brown lustrous bark about 5 mm. thick and marked by conspicuous horizontal white lenticels, and slender red branchlets more or less thickly covered with circular white glands.

Roadsides, Hunker Creek, Yukon District, *J. Macoun*, August 4, 1902 (no. 54412); swamps in the town of Dawson, valley of the Yukon, British Alaska, forming jungles with *Betula glandulosa* Michaux, occasional plants of *Betula alaskana* Sargent, and different willows, *Alice Eastwood*, May 22 and June 14, 1914 (nos. 88, 271=88 type, also nos. 6, 7, 58, 69, 533=69, 89, 272–89, 102, 282, 381).

The relationship of this tree is with *B. glandulosa* Michx., from which it differs in the shape and venation of the leaves, in the pendulous fruiting catkins, and in its arborescent habit.

Betula commixta, n. hyb.? (*B. alaskana*×*glandulosa?*).—Leaves broadly ovate to elliptic, acute at apex, broad-cuneate or rounded at base, coarsely serrate with blunt or acute teeth, thin, glabrous, smooth, dark green and lustrous above, pale and lustrous below, 3–4.5 cm. long and broad; petioles 1.5 cm. in length. Flowers not seen. Fruiting catkins erect, 2 cm. long, 6–7 mm. in

diameter, their scales puberulous, the terminal lobe acute, one-third longer than the rounded lateral lobes.

A shrub 2–3 m. tall, with dark brown stems and slender gray-brown branchlets thickly covered with resinous glands.

On the tundra with *B. glandulosa* in the neighborhood of Dawson, British Alaska, *Alice Eastwood*, Ten Mile House, June 25, 1914 (no. 367 type); Twenty-four Mile House, June 27, 1914 (no. 400).

The proper disposition of this plant is doubtful, and it should perhaps be considered a species. The glandular branchlets and slender erect fruiting catkins resemble those of *B. glandulosa* Michaux, but the larger, acute, sharply serrate leaves are not of that species, and if it is a hybrid the size and serration of the leaves can only have been derived from *B. alaskana* Sargent.

CELTIS OCCIDENTALIS L.—On what is usually considered the type of this species the leaves are broadly ovate, acute or short-acuminate at apex, obliquely rounded at base, coarsely or finely serrate, smooth on the upper surface, glabrous or sparingly pilose along the midribs and veins below, thin, not conspicuously venulose; petioles glabrous or rarely puberulous. The fruit is borne on glabrous or rarely puberulous pedicels much longer than the petioles and is subglobose, ellipsoidal, or slightly obovoid, and 9–10 mm. in diameter; the stone is only slightly reticulate. The branchlets are glabrous or occasionally pubescent.

C. occidentalis is distributed from New England to Virginia and westward to Iowa, southwestern Missouri, western and central Kansas, and eastern North Dakota. It is less common and usually a smaller tree than its varieties *canina* and *crassifolia*, and much less widely distributed than the latter. All the forms of *C. occidentalis* are well distinguished by the dark purple fruit, which is larger than that of the other American species; it is borne on longer pedicels than that of our other species, with the exception of that of *C. Douglasii*.

CELTIS OCCIDENTALIS var. **canina**, n. var.—*C. canina* Rafinesque, Am. Monthly Mag. 2:43. 1817; Planchon, DeCandolle Prodr. 17:174. 1873; Britton and Shafer, N. Am. Trees, 355. 1908.—*C. occidentalis* Sargent, Silva N. Am. 7:67 (in part, *pl. 317*, not Linnaeus). 1895; Hough, Trees N. States and Canada, 193 (in part, *fig. 217*). 1907.—Differing from the type in the usually narrower long-acuminate leaves.

Extreme forms of this variety look very distinct, but trees with leaves intermediate between these and those of the typical form are common. The

fruit varies as in the type from subglobose to obovoid, and there seems little difference in the length of the pedicels, which are always longer than the petioles. The leaves are usually glabrous, but on some of *Bush's* Missouri specimens the midribs and veins are pilose on the lower surface and the petioles are pubescent, as in the variety *crassifolia* (Monteer, nos. 548, 4725; Christian County, no. 4664; Dumas, no. 5905). This variety is distributed from the Province of Quebec to Iowa, Nebraska, North Dakota, and southwestern Missouri, southwestern Oklahoma, New York, and Ohio, and to northwestern Georgia (Cobb County, *R. M. Harper*, no. 166 in Herb. Gray). More distinct is

CELTIS OCCIDENTALIS var. CRASSIFOLIA Gray, Man. ed. 2, 397. 1856.—*C. crassifolia* Lamarck, Encycl. Méth. 4:138. 1797.—Differing from the type in its usually narrower, acuminate, thicker leaves, often more coarsely serrate or nearly entire, scabrate on the upper surface and pilose below along the midribs and veins.

In this form the petioles are usually villose-pubescent, but occasionally are quite glabrous; the pedicels are slightly villose, and the branchlets are glabrous or pubescent.

I have seen specimens of this variety from Viriginia and West Virginia; North Carolina, *A. Gray*, Painted Rock, French Broad River, 1843 (in Herb. Gray); river banks, Biltmore (ex herb. Biltmore no. 1210, with nearly entire leaves); Nashville, Tennessee; southern Indiana, wooded bluff of Blue River, near Middletown, Crawford County, *C. C. Deam*, June 15, 1915 (no. 16423, with coarsely serrate leaves, "a flat-topped shrub about 8 ft. high"), June 25, 1915 (no. 16418, the leaves entire or furnished with occasional teeth, "a shrub 8 ft. high in the dense shade of walnut and buckeye trees"); wooded bluff of the Ohio River, 6 miles east of Cannelton, Perry County, *C. C. Deam*, June 29, 1915 (no. 16627, a tree 8 m. high with nearly entire leaves); southern and western Illinois; Fort Snelling, Minnesota; northern and southern Missouri; central Kansas; eastern and northwestern Oklahoma; Thomas County, central Nebraska; Bigstone, eastern South Dakota; central North Dakota; from the Tongue River Canyon, Big Horn Mountain, Wyoming; from the Black Canyon of the Boise River and the valley of the Clearwater River, Nez Perce County, Idaho; from Berlin, Dallas County, Alabama, *R. S. Cocks*, 1913 (with nearly entire leaves), and from Larissa, Cherokee County, *B. F. Bush*, April 30, 1909 (no. 5561); and Livingston, Polk County, Texas, *E. J. Palmer*, October 9, 1914 (no. 6785).

CELTIS DOUGLASII Planchon, Ann. Sci. Nat. III. 10:293. 1848; Piper, Contrib. U.S. Nat. Herb. 2:221 (Fl. Washington). 1906; Britton and Shafer, N. Am. Trees, 359. *fig. 319*. 1908.—*C. reticulata* Howells, Fl. N.W. America 602 (not Torrey). 1897.—*C. rugosa*

Rydberg, Bull. Torr. Bot. Club 39:304 (not Newberry). 1912.—*C. rugulosa* Rydberg, Fl. Rocky Mountains, 207. 1061. 1917.—This tree, which has sometimes been considered the same as the more southern *C. reticulata* Torrey, can be distinguished from that species by its rather thinner, oblong-ovate, long-acuminate, coarsely serrate leaves, cordate or obliquely cordate at base, glaucescent on the lower surface and glabrous or sparingly pilose on the under side of the midribs and veins, by the slightly pilose petioles, and by the much longer pedicels of the fruit sometimes up to 1.5 cm. in length. The fruit, which has been described as "black or brownish," is light orange-brown on the Oregon and Colorado trees, and is subglobose to ellipsoidal and 7–8 mm. in diameter.

C. Douglasii is a shrub or a small tree rarely 10 m. high, with rough, red-brown, or in Colorado dark gray bark 2.5 cm. thick and irregularly ridged, glabrous or slightly pilose branchlets, and pubescent and tomentose winter-buds.

Nowhere common, it is widely distributed on dry ridges and the rocky banks of streams, and occurs in Oregon east of the Cascade Range in the valley of the Deschutes River, on the rocky banks of the Columbia near the Dalles and on Pine Creek, Gilliam County, and in western Washington ranges from the valley of the Columbia in Klickitat County to the rocky banks of Snake River in Whitman County, and to Big Willow Creek, Canyon County, Idaho; it inhabits the western foothills of the Wasatch Mountains of Utah, southeastern Utah (Grand River Canyon below Moab, Grand County), the southern slope of the Grand Canyon, Arizona (*A. Rehder*, July 19, 1914, no. 103), "in sand at the mouth of a dry canyon one-half mile below Democrat Springs, Kern River," Kern County, California, *Mrs. Leo Polkingham*, September 1916 (in Herb. Dudley), and on the eastern foothills of the Rocky Mountains of Colorado.

In the shape of the coarsely serrate leaves and in the long pedicels of the fruit *C. Douglasii* is related to *C. occidentalis* var. *crassifolia*, from which it differs in its thicker leaves with conspicuous reticulate veinlets and usually glaucescent and less pubescent on the lower surface, and in the color of the fruit. In the thick reticulate-venulose leaves rough on the upper surface it resembles *C. reticulata*. Geographically *C. Douglasii* is intermediate between *C. occidentalis*, which in its var. *crassifolia* reaches northern Idaho, and *C. reticulata*, which extends northward to the Grand Canyon in Arizona.

Celtis Lindheimerii K. Koch apud Engelmann, Dendr. 2:434. 1872.—*C. Helleri* Small, Bull. Torr. Bot. Club 24:439. 1897;

Britton and Shafer, N. Am. Trees 358. *fig. 318.* 1908; Mackensen, Trees and Shrubs of San Antonio, 17. *pl. 3.* 1909.—KOCH's description of *C. Lindheimerii* was made from a tree growing in the Botanic Garden in Berlin which had been raised from seeds gathered at New Braunfels, Texas, by LINDHEIMER and sent by ENGELMANN to Berlin. KOCH's description leaves no doubt that *C. Lindheimerii* (Engelmann in Herb. A. Braun) is the tree with leaves pale and densely pubescent on the lower surface and pubescent branchlets which is common at New Braunfels and in the neighborhood of San Antonio.

Of the specimens of this tree which I have seen the oldest was collected by *Drummond* in 1834 without locality but probably near Austin (nos. 343?, 334, 259 in Herb. Gray). It was collected by *Lindheimer* at New Braunfels, Comal County, in 1850 (no. 444 in Herb. Gray). *Mohr* collected it in the valley of the Comal River, New Braunfels, in 1850. I collected it at San Antonio, Bexar County, in 1881, and *Bush* also collected it at San Antonio October 1900 (no. 1246), September 1901 (no. 797), and March 1902 and 1903 (nos. 1172, 3677). *Palmer's* collections of this tree are from Sutherland Springs, Wilson County (no. 9302), Goliad, Goliad County (no. 9128), San Marcos, Hays County (no. 13311), dry limestone banks, South Llano River, Telegraph, Kimble County (no. 10931).

C. Lindheimerii is most abundant in the neighborhood of streams and springs and occurs less commonly on higher ground. I have no evidence that it grows on the Edwards Plateau or westward.

CELTIS RETICULATA Torrey, Ann. Lyc. N.Y. 2:247. 1828; Planchon, Ann. Sci. Nat. III. 10:293. 1848.—*C. occidentalis* var. *reticulata* Sargent, Forest Trees N. Am. 10th Census U.S. 9:126. 1884; Garden and Forest 3:40. *fig. 12.* 1890.—*C. mississippiensis* var. *reticulata* Sargent, Silva N. Am. 7:72 (in part). 1895; Man. 301. *fig. 243.* 1905.—*C. reticulata*, *C. Lindheimerii*, and *C. Douglasii* are similar in their thick leaves, rough on the upper surface and conspicuously reticulate venulose below, and in their pedicels longer than the petioles. The entire leaves green on the lower surface and the orange-red fruit on shorter pedicels of *C. reticulata* distinguish it from *C. Douglasii*. The shape of the leaves of *C. Lindheimerii*, pale and pubescent below over their whole surface, makes it easy to distinguish that species from *C. reticulata*.

I have not seen the flowers and spring leaves of *C. reticulata*, which, although it was described 90 years ago, is still very imperfectly known. The young

leaves, like those of the other species of this group, probably show little evidence of the prominent veinlets which are not conspicuous on them before early summer. In collections of Texas plants *C. Lindheimerii* and more frequently *C. laevigata* var. *texana* have been confounded with *C. reticulata*.

Seedlings raised at the Arboretum from seeds of a tree with rough, mostly entire leaves growing at the Montezuma Well in central Arizona (*Rehder*, no. 537) have coarsely serrate leaves which are rough or nearly smooth above on the same branchlet.

From western Texas I have seen specimens of *C. reticulata* collected in Uvalde, Kimble, Mitchell, Nolan, Callahan, Randall, Hartley, and Jeff Davis counties. It ranges into western Oklahoma, and through southern New Mexico to southern, central, and northeastern Arizona, and occurs on Cedros Island off the coast of Lower California (*Veatch*, 1872, in Herb. Gray).

CELTIS RETICULATA var. **vestita**, n. var.—Differing from the type in its more pubescent serrate leaves and more pubescent petioles. Leaves broadly ovate, acute or acuminate at apex, unsymmetrically rounded or subcordate at base, the margins thickened, ciliate, and sharply but irregularly serrate, thick, dark green and scabrate above, paler and coated below with short pale pubescence with longer hairs on the slender midribs, primary veins, and conspicuoulsy reticulate veinlets, 3·5–4·5 cm. long and 3–3·5 cm. wide; petioles densely tomentose, 4–5 mm. in length; leaves on vigorous shoots acuminate, mostly cordate at base, more coarsely serrate, rugose, and covered above with short white hairs and more densely pubescent below, 6–8 cm. long and 4–4·5 cm. wide, their petioles thickly covered with matted pale hairs, 8–9 mm. in length. Fruit orange-red, 6–7 mm. in diameter.

A small tree with a trunk 20–25 cm. in diameter and slender pubescent branchlets, those of vigorous shoots stouter and densely villose.

Near Canton, Blaine County, Oklahoma, in low ground along the North Fork of the Canadian River, *D. M. Andrews*, August 15, 1915 (nos. 21, 49 type).

Specimens of vigorous sterile branches collected by *Palmer* at Canadian, Hemphill County, Texas, June 17, 1918 (no. 14109), may prove a distinct form of this variety. The leaves are acuminate, obliquely cordate at base, coarsely serrate, more pubescent below, 6–9 cm. long and 3·5–5 cm. wide; the petioles and branchlets are densely tomentose.

CELTIS LAEVIGATA Willdenow, Berl. Baum. ed. 2. 81. 1811.—*C. mississippiensis* Bosc in Encycl. Mét. Agric. 7:577 (*nomen nudum*). 1821; Spach, Ann. Sci. Nat. II. 16:42. 1841.—*C. Berlandierii* Klotzsch, Linnaea 20:541. 1847; Parlatore, DeCandolle

Prodr. 17:178 (in part). 1873.—For this tree of the southern states the name *C. mississippiensis* has usually been adopted. Bosc published a brief account, without a name or technical description, of Le Microcoulier de la Louisiana cultivated in France in the *Nouveau Cours Complet d'Agriculture* (8:529. 1809), and republished it in the second edition of this work (10:41. 1822). As his plant came from near the mouth of the Mississippi River there is little doubt of its identity with the *C. mississippiensis* of Spach, for it was Spach who first described this tree as *C. mississippiensis*, Bosc's earlier *C. mississippiensis* being a *nomen nudum* and 10 years later than *C. laevigata* of Willdenow which, following K. Koch, must be taken up for our tree. A cotype of *C. Berlandierii* Klotzsch (no. 2318), collected by *Berlandier* at "Matamoras de Tamaulipas," April 1831, is preserved in the Gray Herbarium on a sheet with *Berlandier's* no. 885, also collected at Matamoras in April 1831. A fragmentary specimen with flowers, collected by *Berlandier* in February 1828 (no. 1487–2271), a fruiting branch without locality or date and numbered 2429 on a label printed for the Gray Herbarium, and a vigorous shoot (no. 2429–999), collected by *Berlandier*, May 1824, "De Goliad à Bexa," are mounted on another sheet. The leaves and fruit of these *Berlandier* specimens only differ in their smaller size from specimens of the leaves and fruit of *C. laevigata* grown on the rich bottom lands of the Mississippi Valley, a difference which the dryness of the region where *Berlandier* collected them explains.

C. laevigata, when it grows under favorable conditions, is a tree sometimes 30 m. high, with somewhat pendulous branches and slender, glabrous, red-brown branchlets. The leaves are thin, usually oblong-lanceolate, long-pointed and acuminate at apex, unsymmetrically rounded and often oblique or cuneate at base, frequently more or less falcate, entire or furnished with a few teeth usually toward the apex, green on both surfaces, glabrous, smooth or occasionally scabrate above. The fruit is bright orange-red on pedicels shorter or slightly longer than the petioles.

C. laevigata is distributed from the coast of Virginia to the Everglade Keys of southern Florida and through the Gulf states to the valley of the lower Rio Grande in Nuovo Leon, Mexico, and through eastern Texas and Arkansas to

eastern Oklahoma and Kansas, northern Missouri, southern Illinois, and southwestern Indiana; also in Bermuda. Trees occasionally occur with leaves more or less sharply serrate nearly to the base, and this variety may be distinguished as

CELTIS LAEVIGATA var. **Smallii,** n. var.—*C. Smallii* Beadle, Small Fl. S. United States, 365. 1329. 1903.—Differing from the type only in its constantly serrate leaves.

CELTIS LAEVIGATA var. **texana,** n. var.—*C. texana* Scheele, Linnaea **22**:146. 1847.—*C. Berlandierii* Planchon, DeCandolle Prodr. **17**:178 (in part, not Klotzsch). 1873.—Differing from the type in the shorter ovate to lanceolate thicker leaves often pubescent on the midribs and veins below, in the often more prominent veinlets and pubescent petioles, and in its often pubescent branchlets. Leaves ovate to lanceolate, acuminate, unsymmetrically rounded or cordate at base, entire or sparingly and irregularly serrate, often subcoriaceous, dark green, smooth and granulate or rarely scabrate above, green below, with slender midribs and primary veins glabrous or sparingly villose-pubescent and furnished with small axillary tufts of pale hairs, and thin, only slightly raised, reticulate veinlets, 3.5–7 cm. long and 2–3.5 cm. wide; petioles slender, pale pubescent, 5–7 mm. in length. Flowers not seen. Fruit subglobose but rather longer than broad, dark orange-red, 6–7 mm. in length; pedicels glabrous or puberulous, slightly longer than the petioles.

An arborescent shrub or small tree rarely more than 8 m. high, often growing in groups, with pale or grayish rough bark rarely covered with wartlike excrescences, and slender, reddish, glabrous or gray-brown, pubescent branchlets.

I have taken up SCHEELE'S name for the common *Celtis* of the Edwards Plateau and western Texas with some hesitation, for I have not seen his type specimen. His description perfectly applies, however, to a specimen collected by *Lindheimer* at New Braunfels in the herbarium of the Arboretum (no. 4 ex herb. Engelmann as *C. texana*). On other specimens collected by *Lindheimer* at New Braunfels the lower side of the midribs and veins of the leaves are sparingly villose-pubescent, and such pubescence is found on the leaves of most of the specimens which I have referred to this variety.

TEXAS.—New Braunfels, Comal County, *F. Lindheimer,* 1850 (nos. 1158, 1159 in Herb. Gray, distributed by the Mo. Bot. Gard. as *C. Berlandierii*); no. 4 (in Herb. Arnold Arboretum ex Herb. Engelmann, type); Comanche

Spring, New Braunfels, *C. Mohr*, December 1880; San Antonio, Bexar County, *B. F. Bush*, October 2, 1900 (no. 1223), September 16, 1901 (no. 807), March 23, 1902 (no. 1174), *B. Mackensen*, October and December 1910; Sutherland Springs, Wilson County, *E. J. Palmer*, March 30, 1916 (no. 9297); Pleasanton, Atascosa County, *E. J. Palmer*, September 23, 1916 (no. 10773); rocky river banks, Blanco, Blanco County, April 6, 1918 (no. 13294), *Berlandier* "entre le rio de las Nueces et Laredo," June 1820 (nos. 601, 2011 in Herb. Gray); Boerne, Kendall County, *E. J. Palmer*, May 18, 1918 (no. 13644, with hoary tomentose branchlets); Kerrville, Kerr County, *B. Mackensen*, May 1, 1910; Uvalde, Uvalde County, *E. J. Palmer*, April 10 and May 6, 1918 (nos. 13324, 13509, with coarsely serrate leaves scabrate on the upper surface); Sweet Water, Nolan County, *E. J. Palmer*, July 6, 1917 (nos. 12432, 12433); Barksdale, Edwards County, *E. J. Palmer*, May 7, 1918 (no. 13519); banks of Devil's River, Valverde County, *E. J. Palmer*, May 14, 1918 (no. 13601); Limpia Canyon, Jeff Davis County, *Tracy* and *Earl*, April 25, 1902 (no. 238 in Herb. Gray); Post, Garza County, *E. J. Palmer*, May 31, October 1, 1918 (nos. 13837, 14565); banks Canadian River, Canadian, Hemphill County, *E. J. Palmer*, June 17, 1918 (no. 14110); Strawn, Palo Pinto County, *E. J. Palmer*, June 27, 1918 (no. 14256); Gamble's Ranch, Armstrong County, June 6, 1918 (no. 13969); along the Brazos, Graham, Young County, *J. Reverchon*, October 27, 1902 (nos. 3262, 3267); dry rocky hillsides, Baird, Callahan County, *E. J. Palmer*, May 26, 1918 (no. 13680); Paloduro Canyon, Potter County, *J. Reverchon*, May 22, 30, 31, 1902 (nos. 3265, 32 f. f. 2930, 2930 bis), *E. J. Palmer*, June 3, 1918 (no. 13866), *C. S. Sargent*, April 1916; Tivoli, Refugio County, *E. J. Palmer*, March 22, 1916 (no. 9250, with broadly ovate coarsely serrate leaves and pubescent branchlets); Austin, Travis County, *G. W. Letterman*, August 23, 1892; Dallas, Dallas County, *J. Reverchon*, August 1860 (no. 854), *B. F. Bush*, September 30 and October 27, 1900 (nos. 1190, 1614, 1615), April 8, 1904 (no. 4254); rocky bluffs, Dallas County, *J. Reverchon*, April 15, 1902; bottom lands Elmo, Kaufman County, *J. Reverchon*, October 22, 1902 (no. 3263); "sandy woods, Forks of the Trinity," Dallas County, *J. Reverchon*, (no. 3268); along the Brazos, Bryan, Brazos County, *E. J. Palmer*, April 26, 1918 (no. 13459); Velasco, Brazoria County, *E. J. Palmer*, March 21, 1918 (no. 13133); Columbia, Brazoria County, *E. J. Palmer*, September 29, 1914 (no. 66760); San Augustine, San Augustine County, *E. J. Palmer*, April 1, 1918 (no. 13245); Houston, Harris County, *E. J. Palmer*, March 19, 1918 (no. 13113); *E. N. Plank*, Eagle, Shelby County.

OKLAHOMA.—Sand hills, Ingersoll, Alfalfa County, *C. S. Sargent*, May 6, 1902; near Page, Leflore County, *G. W. Stevens*, September 1913 (no. 2724); low woods along river, Clinton, Custer County, *E. J. Palmer*, July 16, 1917 (no. 1255).

NEW MEXICO.—*A. Fendler*, without locality, 1847 (no. 775 in Herb. Gray); Berendo Creek, Sierra County, *C. B. Metcalf*, May 23, 1904 (no. 926); bank of creek near Roswell, Chaves County, *A. Rehder*, August 16, 1916 (no. 352).

KANSAS.—Woods, Barber County, *A. S. Hitchcock*, 1896 (no. 815 in Herb. Gray); vicinity of Huntsville, Walker County, *R. A. Dixon*, July 1909 (no. 387 in Herb. Gray).

MISSOURI.—Willard, Greene County, *J. W. Blankinship*, August 2, 1893; Noel, McDonald County, *B. F. Bush*, August 7, October 12, 1908 (nos. 4977, 5255), *E. J. Palmer*, September 5, 1913, May 5, 1914, October 11, 1918, (nos. 4141, 5795, 14665, 14668); "along rocky banks," Carthage, Jasper County, *E. J. Palmer*, 1917, Webb City, *E. J. Palmer*, September 28, 1908; Knight's Station, *C. S. Sargent* and *E. J. Palmer*, October 8, 1911 (no. 3489), July 13, 1913 (no. 4019).

MEXICO.—Reynosa, Tamaulipas, on the lower Rio Grande, *C. G. Pringle*, August 7, 1888 (no. 2082); Saltillo, Coahuila, *Ed. Palmer*, 1898.

CELTIS LAEVIGATA TEXANA f. **microphylla**, n. f.—Differing from the variety in its smaller leaves with more prominent reticulate veinlets, and more densely villose-pubescent petioles. Leaves broadly ovate, acute, unsymmetrically rounded at base, smooth, dark green and granulate above, yellow-green below, with villose pubescent midribs and veins and conspicuous reticulate veinlets, 2–2.5 cm. long and 1.5–2 cm. wide. Flowers and fully grown fruit not seen.

A shrub with slender, red-brown branchlets densely pubescent in their first season, becoming puberulous in their second year.

Rocky banks of streams, Sweet Water, Nolan County, Texas, *E. J. Palmer*, May 27, 1918 (no. 13751 type).

CELTIS LAEVIGATA var. **brachyphylla**, n. var.—Differing from the type in the shorter thicker leaves. Leaves ovate, acuminate and long-pointed at apex, very oblique and rounded or cordate at base, entire, occasionally furnished on one side near the base with a broad rounded lobe, glabrous, thick and firm, green on the two surfaces, 3.5–4 cm. long and 2–3 cm. wide, with slender midribs and veins; petioles slender, glabrous, 5–6 mm. in length. Fruit subglobose to short-oblong, bright orange-red, 6–7 mm. in diameter; pedicels glabrous, longer than the petioles.

A tree about 10 m. tall, with slender, glabrous, dark red-brown branchlets.

Rocky banks of the canyon of the Nueces River near Uvalde, Uvalde County, Texas, *E. J. Palmer*, September 26, 1918 (no. 14517 type).

CELTIS LAEVIGATA var. **anomala**, n. var.—Differing from the type in its oblong-ovate, acute leaves, cordate or unsymmetrically

cordate at base, and dark purplish fruit covered with a glaucous bloom. Leaves entire, glabrous, dark green and scabrate above, paler and conspicuously reticulate venulose below, 2–4 cm. long and 1.5–2 cm. wide; petioles sparingly villose pubescent, 4–6 mm. in length. Fruit short-oblong, 6–7 mm. in length, the pedicels as long as or slightly longer than the petioles.

A shrub from 1.5–2 cm. tall with slender pubescent branchlets.

"In deep sands, among shin oak and *Quercus marylandica*," Clyde, Callahan County, Texas, *E. J. Palmer*, September 30, 1918 (no. 14550, type).

CELTIS LAEVIGATA var. **brevipes**, n. var.—*C. brevipes* S. Watson, Proc. Am. Acad. 14:297. 1879.—Differing from the type in its yellow fruit on shorter puberulous pedicels and in its puberulous petioles. Leaves ovate, acuminate, unsymmetrically rounded or cuneate at base, entire or rarely furnished with occasional teeth, glabrous, dark green and smooth or slightly roughened on the upper surface, yellow-green below with small clusters of pale hairs in the axils of the slender veins, inconspicuously reticulate venulose, 3.5–5 cm. long and 1–2.5 cm. wide; petioles slender, puberulous, 5–7 mm. in length. Flowers not seen. Fruit short-oblong, canary yellow, 5–6 mm. long; pedicels puberulous, shorter or slightly longer than the petioles.

A small tree with slender, glabrous, red-brown branchlets.

ARIZONA.—Camp Grant, Pinal County, *T. J. Rothrock*, July 1874 (no. 337, type of *C. brevipes* in Herb. Gray), *J. G. Lemmon*, 1880 (no. 68 in Herb. Gray)—; along irrigating ditches, Tucson, Pima County, *Engelmann* and *Sargent*, September 24, 1880; banks of Rillito Creek near Tucson, *A. Rehder*, August 7, 1917 (no. 240 type); Apache Trail, Fish Creek, *Alice Eastwood*, April 19, 1917 (no. 6250); Crow Creek Canyon, Chiricahua Mountains, Cochise County, *J. W. Toumey*, July 1894 ("tree 18°×20′–30′"); Tonto Basin, Gila County, *J. W. Toumey*, June 19, 1892.

UTAH.—River Canyon, southeast Utah, *Alice Eastwood*, June 1892.

CALIFORNIA.—Laguna, San Diego County, *D. Cleveland*, July 10, 1885.

The specimens of *C. brevipes* in Herb. Gray and the specimen from San Diego County, California, have only partly grown fruit, but in the shape of the leaves they so closely resemble the yellow-fruited Arizona trees that there can be little doubt that they are of the same variety, although on the Californian specimen the leaves are distinctly rough on the upper surface, as they are in the specimen collected by *Engelmann* and *Sargent* at Tucson.

CELTIS PUMILA Pursh, Fl. Am. Sept. 1:200. 1814; E. J. Hill, Bull. Torr. Bot. Club 27:497. *pl. 33.* 1900.—*C. occidentalis* B *pumila* Muhlenberg, Cat. 100 (*nomen nudum*). 1813; Gray, Man. ed. 2. 397. 1856.—*C. mississippiensis* var. *pumila* Mackensen and Bush, Man. Fl. Jackson County, Missouri, 72. 1902.—Often considered a variety of *C. occidentalis*, *C. pumila* can be separated from that species by its smaller, usually entire, rather thicker leaves, by its small, dark reddish purple fruits on pedicels shorter or only slightly longer than the petioles, by its more deeply pitted nutlet, and shrubby habit. The color of the fruit and its short pedicels indicate a nearer relationship with *C. laevigata* than with *C. occidentalis*.

C. pumila has been found in Pennsylvania, Delaware, and the District of Columbia, western New York, northern Indiana and Illinois, middle Tennessee, northeastern Mississippi, near Augusta, Georgia, near Lake Okeechobee, Florida (*Ed. Palmer*, 1874, no. 515 in Herb. Gray), Missouri, and northeastern Arkansas (Eureka Springs, Carroll County, *E. J. Palmer*, no. 4409).

A branch without fruit, with small, nearly entire, glabrous leaves, collected by *Mohr* on uplands west of Franklin, Alabama, October 8 (no year, no. 66), and described as "a low spreading tree of slender growth," appears in spite of its habit to be *C. pumila*. A glabrous specimen with pedicels as long as or longer than the petioles collected on the sandy seashore at Hillsboro, Florida, by *F. A. Marten* (no. 6506 in Herb. Gray) is probably from a depauperate form of *C. laevigata*.

CELTIS PUMILA var. **georgiana**, n. var.—*C. occidentalis* Abbot and Smith, Insects of Georgia, *pl. 36* (not L.). 1797.—*C. occidentalis* var. *pumila* Chapman, Fl. 417 (not Muhlenberg). 1865.—*C. georgiana* Small, Bull. Torr. Bot. Club. 24:439. 1897; Britton and Shafer, N. Am. Trees, 357, *fig. 316.* 1908.—Differing from the type in the rugose upper surface of the leaves, more or less densely pilose along the midribs and veins below, in the pilose petioles, and puberulous pedicels.

A shrub or small tree occasionally 10 m. tall, with slender pubescent branchlets sometimes becoming glabrous by the end of their first season. The fruit was described as "tan" color by SMALL, and by BRITTON and SHAFER as "red-purple to yellowish." The fruit when fully grown in early summer is dull yellow in color, but by the middle of October it becomes reddish purple like that of *C. pumila*, and is often covered with a glaucous bloom.

C. pumila var. *georgiana* occurs on rocky bluffs, Franklin Furnace, Sussex County, New Jersey (*K. K. MacKenzie*, August 22, 1909, no. 4331), and ranges from the Piedmont region of North Carolina (Raleigh, Wake County, *T. G. Harbison*, June 11, 1918) to western Florida, Autauga and Dallas counties, Alabama, and occurs in southern Missouri (rocky hills and bluffs, *B. F. Bush*, Swan, Taney County, September 23, 1905 [no. 5040], Monteer, Shannon County, August 18, 1901 [no. 703], Noel, McDonald County, August 9, 1908 [no. 5040]). The oldest specimen of this plant which I have seen was collected near Augusta, Georgia, by *Olney* and *Metcalf* in 1855 (in Herb. Gray).

On the rocky wooded slopes and ridges of Lawrence, Orange, Washington, Crawford, Perry, Floyd, and Harrison counties in the extreme southern part of Indiana a dwarf *Celtis* occurs in a few isolated stations. In the general outline of the leaf it resembles *C. pumila*, but the pedicels of the lighter-colored fruits are much longer; the leaves, which are smooth or nearly so on the upper surface and rather thicker than those of *C. pumila*, are slightly pubescent along the under side of the midribs and veins and on the petioles; the branchlets are usually puberulous. Judged by the present inadequate information now accessible concerning this plant it appears intermediate between *C. pumila* and its variety *georgiana*, although the nutlets are smoother than those of *C. pumila*, and it may be distinguished as

CELTIS PUMILA var. **Deamii**, n. var.—Leaves broadly ovate to oblong-ovate, acuminate and often long-pointed at apex, unsymmetrically rounded at base, entire or occasionally sharply and irregularly serrate above the middle, thick, dark green on both surfaces, smooth or slightly roughened above, 3-nerved, reticulate venulose, slightly villose pubescent on the prominent midribs and veins, 6–8 cm. long and 3.5–4 cm. wide; petioles slender, villose pubescent, 8–10 mm. in length; leaves on vigorous shoots acute or acuminate, obliquely rounded at base, thicker, entire, scabrate above, often 10 cm. in length. Flowers not seen. Fruit subglobose, ellipsoidal or slightly obovoid, tan color or orange until after midsummer, becoming when fully ripe dark orange-red, 7–8 mm. in diameter; pedicels 6–15 mm. long.

An arborescent shrub 2–4 m. high, with a stem 3.5–5 cm. in diameter, covered with dark, rough, deeply fissured bark and slender, reddish brown, slightly pubescent branchlets.

C. C. Deam, 6 miles from Derby, Perry County, July 4, 1912 (no. 11502), near Mitchell, Lawrence County, August 16, 1912, September 2, 1915, August 13, 1918 (nos. 12052, 12055, 18474, 18479, 26218), wooded bluffs of the Ohio River west of Leavenworth, September 11, 1915 (nos. 18586, 18589), on a bluff 3 miles south of New Middletown, Harrison County, September 6, 1915 (no. 18727 type), near Big Springs, Washington County, September 12, 1915 (no. 8987), wooded bluff, Indian Creek, near Corydon, Harrison County, August 15, 1918 (no. 26232), near Elizabeth, Harrison County, September 26, 1918 (no. 26798).

I take much pleasure in associating with this plant the name of CHARLES CLEMON DEAM, State Forester of Indiana, who for many years has industriously studied the trees of Indiana.

PERSEA PUBESCENS (Pursh) Sargent.—The first varietal name *pubescens* of PURSH (1814) was taken up for this tree in *The Silva of North America* (7:7. 1895); but under the rules adopted by the Vienna Congress the first specific name must be used, and this is *palustris* (*Tamala palustris* Rafinesque, Fl. Tellur. 137. 1838), and *Persea pubescens* (Pursh) Sargent should become *P. palustris* (Rafinesque) Sargent.

PLATANUS OCCIDENTALIS L.—The leaves of the northern plane tree are broadly ovate, 3–5-lobed by broad shallow sinuses rounded in the bottom, cordate or truncate at base, becoming glabrous except on the under side of the midrib and principal veins, the lobes broad, acuminate, serrate-toothed with long straight or curved remote acuminate teeth. Individual trees with leaves cuneate at base may be distinguished as

PLATANUS OCCIDENTALIS f. **attenuata,** n. f.—Differing from the type in the long cuneate base of the usually less deeply lobed leaves.

I have seen specimens of this form from Selma, Dallas County, Alabama, *T. G. Harbison*, June 31, 1916 (no. 51 type). Mississippi: *T. G. Harbison*, Pelahatchee, Rankin County, May 26, 1915 (no. 14), Jackson and Bolton, Hinds County, June 28, 29, 1916. Texas: *E. J. Palmer*, banks of Peyton's Creek, Matagorda County, May 6, 1916 (no. 9683), rocky creek banks, Boerne, Kendall County, May 19, 1916, Lacey's Ranch, Kerr County, May 31, 1916 (no. 9982). Oklahoma: *G. W. Stevens*, valley of the Chikaskia River near Tonkawa, Kay County. Missouri: *B. F. Bush*, near Monteer, Shannon County, September 1, 1911 (no. 663). Indiana: *C. C. Deam*, low banks of the Wabash River, near Murray, Wells County, May 26, 1916 (no. 19817).

PLATANUS OCCIDENTALIS var. **glabrata,** n. var.—*P. racemosa* Hemsley, Bot. Biol. Am. Cent. 3:162 (not Nuttall). 1882.—*P. glabrata* Fernald, Proc. Am. Acad. 36:493. 1901.—*P. densicoma* Dode, Bull. Soc. Dendr. France 7:67. 1908.—Differing from the type in the 3-lobed leaves, truncate, broad-cuneate or rarely slightly cordate at base. Leaves usually broader than long, truncate, broad-cuneate or rarely cordate at base, 3-lobed by sinuses acute or rounded in the bottom, the lobes long-acuminate, entire, the lateral often furnished near the base with one or rarely with two small acuminate incurved secondary lobes, occasionally found also on the terminal lobe; when they unfold hoary tomentose below and pubescent above; pubescent when the flowers open toward the end of March, and in early summer pubescent along the under side of the midribs and veins but otherwise glabrous, usually 7–14 cm. long and 8–9 cm. wide, their petioles pubescent, becoming glabrous; peduncles with one or occasionally two heads of flowers and fruit.

Described from specimens collected in the Provinces of Coahuila and Nuovo Leon, Mexico, this *Platanus* has been found not to be uncommon in western Texas, where it has been collected by *S. B. Buckley* near Austin (without date or number), by *A. A. Heller*, Kerrville, Kerr County, April 1894 (no. 1622), and by *E. J. Palmer* on the banks of the Llano River at Llano, Llano County, June 23, 1916 (no. 10279), rocky banks of upper Seco Creek, Bandera County, May 18, 1916 (no. 10241), gravel bank, Nueces River, Uvalde, Uvalde County, September 24, 1918 (no. 14480), Fredericksburg Junction and Boerne, Kendall County, June 5 and May 19, 1916 (nos. 9817, 9826, 10069), rocky banks of the Guadalupe River, Kerrville, Kerr County, May 29, 1916 (no. 9921), rocky banks of upper Seco Creek, June 18, 1916 (no. 10241), Utopia and Sabinal, Uvalde County, April 10, 1917, June 7, 1916 (nos. 10100, 11523), rocky banks, Devil's River, Valverde County, October 18, 1916, March 26, 1917 (nos. 11084, 11371), Palliam, Zavalla County, March 21, 1917 (no. 11332).

The close connection of this variety with typical *P. occidentalis* is shown by the appearance on leading shoots of 5-lobed leaves with serrate lobes (*Palmer*, Sabinal, Uvalde County, no. 10100, and Devil's River, Valverde County, no. 110841). More significant perhaps is the fact that occasionally trees occur growing with *P. occidentalis* north of Texas which cannot be distinguished from the Mexican types of *P. glabrata*. Such specimens are those of *E. J. Palmer*, Choctaw County, Oklahoma, July 13, 1916 (no. 10463), the type of *P. densicoma* collected in the Maquoketa River, Jackson County,

eastern Iowa, preserved in Herb. Mus. Paris (photograph Herb. Arnold Arboretum), Biltmore, North Carolina (Herb. Bilt. no. 1271b), and of *John Robinson*, Brookline, Massachusetts, June 1880.

MAGNOLIA VIRGINIANA L.—*M. glauca* L.—This species was based on the *Tulipifera virginiana* Plukenet, Alm. Bot. 379. *pl. 68*, and the *Magnolia foliis ovato-lanceolatis* Linnaeus, Hort. Cliff. 222; Gronovius, Fl. Virg. 61; and the *Magnolia Lauri folia subtus albicante* Catesby, Nat. Hist. Car. 1:39. *pl. 30*.

There are two distinct forms of this tree, one with glabrous branchlets and pedicels and usually narrow leaves, and one with branchlets and pedicels thickly clothed with long, silvery white hairs and often broader leaves. Specimens preserved in the British Museum show that the former is the type of LINNAEUS' species. *Tulipifera virginiana*, etc., of PLUKENET is represented in the Sloan Herbarium by 2 specimens, one in PLUKENET's own herbarium, the other one of a number of plants collected in Maryland by *Dr. Krieg* and a *Mr. Vernon*. The latter, Dr. RENDLE tells me, agrees with PLUKENET's figure and has a glabrous pedicel. Of the *Hort. Cliff.* specimens Dr. RENDLE writes: "We have a specimen labeled *glauca*. The species' names, however, in *Hort. Cliff.* are rarely in LINNAEUS' handwriting and *glauca* is in the usual hand, but there is also written in what may be LINNAEUS' own hand *Magnolia* Catesby, with a reference to t. 39; this suggests that LINNAEUS regarded the *Hort. Cliff.* plant as identical with CATESBY's. The specimen is in flower and has a glabrous pedicel." CATESBY'S specimen in the British Museum has no flower, but his plate plainly shows that the pedicel is glabrous.

The typical *Magnolia glauca* is a small tree rarely more than 10 m. high, or often a shrub. It is the only form which grows from Massachusetts to southeastern Virginia. Farther south it is rare and I have only seen specimens from Newbern, North Carolina, Darlington, Andrews, Bluffton, Georgetown, and Yemassee, South Carolina, and Meldrin, Georgia. Specimens collected in Florida in the vicinity of Eustis Lake, Lake County, by *G. V. Nash* (no. 575) and in the neighborhood of Orlando, Orange County, by *C. H. Baker* and *T. G. Harbison* have petioles, pedicels, and branchlets puberulous. For the form with the pubescent pedicels and branchlets I suggest the name

MAGNOLIA VIRGINIANA var. **australis**, n. var.—Differing from the type in the silky white pubescence on the pedicels and branchlets.

Leaves remaining on the branches until spring without change of color, elliptic to oval, oblong-obovate or rarely lanceolate, with puberulous, pubescent, or tomentose petioles and varying in width from 2.5 to 9.5 cm., trees with the broadest leaves being confined to western Louisiana and eastern Texas. This southern variety of *M. virginiana* is a tree often 20–30 m. high with a tall trunk occasionally 1 m. in diameter, covered with pale smooth bark and short small branches forming a narrow round-topped head, and branchlets more or less thickly covered during their first season with white silky pubescence, usually gradually disappearing in their second year; in southern Florida often much smaller, and on the Everglade Keys, where it is "very common, a shrubby tree up to 3 m. high" (*E. A. Bessey*).

Swamps in the neighborhood of Wilmington, North Carolina, is the most northern station from which I have seen specimens of this tree; it is common in the coast region of South Carolina and Georgia and in all parts of Florida, and the only form of *M. virginiana* in the other Gulf states, where it occurs as far west as the valley of the Nueces River in Texas (San Augustine County), but is much less common west of the Mississippi River than it is farther east. Although it crosses the Florida peninsula this *Magnolia* is most abundant in the coast region. It ranges inland, however, to Cuthbert, Randolph County, in western Georgia, to Tuskegee and Selma, Alabama, and to Tishomingo County in the extreme northeastern corner of Mississippi, and to Winn and Natchitoches parishes in western Louisiana.

MAGNOLIA ACUMINATA var. **ludoviciana,** n. var.—Differing from the type in its broadly obovate, oval, or ovate leaves abruptly short-pointed at apex and rounded or cuneate at base, and in its much larger flowers. Leaves hoary tomentose below and slightly pubescent above when they unfold, becoming when the flowers open glabrous and yellow-green on the upper surface and pubescent on the lower surface with short pale hairs, 15–18 cm. long and 9–13 cm. wide; petioles puberulous, 2.5–4 cm. in length. Flowers 8–10 cm. long, the outer petals up to 4 cm. in width.

A large tree.

Rich woods, West Feliciana Parish, Louisiana, Dessert Plantation near Catalpa, *Cocks* and *Sargent*, April 12, 1916 (type); West Plantation near Catalpa, *Cocks* and *Sargent*, April 10, 1914; near St. Francisville, *R. S. Cocks*, May 15, 1915, and Catalpa, October 15, 1915.

ACER SACCHARUM Marsh.—The lower surface of the leaves of the northern sugar maple is usually green and glabrous, but it is sometimes glaucous or glaucescent and southward is slightly pubescent along the under side of the midribs and veins; and as the pale color of the lower surface of the leaves gives the trees a distinct appearance the varietal name adopted for them by some European dendrologists will probably be helpful. This form becomes

ACER SACCHARUM var. **glaucum,** nov. comb.—*A. saccharinum* var. *glaucum* Pax, Engler Bot. Jahrb. 7:242. 1886; Wesmael in Bull. Soc. Bot. Belg. 29:61. 1890.—*A. palmifolium* var. *glaucum* Schwerin, Gartenflora 42:455. 1893.—The leaves of this variety resemble those of the green-leaved variety in size and shape and are glabrous or in the southern states usually slightly pubescent on the under side of the midribs and veins.

From the North, where it is much less common than the green-leaved form, I have seen specimens of this variety only from Isle-aux-Couvres in the St. Lawrence River, from Prince Edward Island, Nova Scotia, Lake St. John and St. Anne's, Quebec, northern Vermont, Cooperstown, New York, western Pennsylvania, and Youngstown, Ohio; it is more common in southern Michigan and Indiana, and occurs in northeastern Iowa and central Tennessee. It is still more common in Missouri and northern Arkansas, and is the only form I have seen from South Carolina, Alabama, Mississippi, Louisiana, and southern Arkansas, where the sugar maple is not a common tree.

ACER SACCHARUM var. RUGELII Rehder, Cyclopedia Am. Hort. 1:13. 1900; Sargent, Man. *fig. 515.* 1905.—*A. Rugelii* Pax, Engler Bot. Jahrb. 7:243. 1886.—*A. saccharinum* subspec. *Rugelii* Wesmael, Bull. Soc. Bot. Belg. 29:61. 1890.—In *The Silva of North America* this form of the sugar maple was confused, at least in part, with *A. nigrum.* As it is now understood, the leaves of this variety are usually broader than long and are cordate or rounded at base, 3-lobed with long acuminate lobes, usually entire or the lower lobes occasionally furnished near the base with a small rounded lobe; the leaves are 3-nerved, thick, dark green above, green or glaucescent and glabrous on the lower surface, but on specimens collected by *Palmer* at Williamsville, Wayne County, Missouri (no. 6096), and from a large tree with short-lobed leaves at Campbell, Dunklin County, Missouri (*C. S. Sargent,* October 5, 1910), the lower surface of the leaves is thickly covered with loose pubescence.

This variety appears to be rare and local and to occupy a comparatively restricted area. The type station is at Dandridge on the Tennessee River, Jefferson County, Tennessee, and I have seen specimens from Knoxville, Tennessee, Eureka Springs, northwestern Arkansas, Williamsville, Campbell, and Allenton, Missouri, Lansing, Ingram County, Michigan, from Parry Sound, Georgian Bay (*B. E. Fernow*, 1908, a single tree), and Point Pelee in Lake Erie, Essex County, Ontario (*C. K. Dodge*, 1911).

ACER SACCHARUM var. **sinuosum**, n. var.—*A. sinuosum* Rehder, Sargent, Trees and Shrubs, **2**:255. *pl. 195*. 1913.—The distinctive character of *A. sinuosum* was found in a projection into the broad sinus at the base of the leaves formed by the nerves of the 2 upper lobes which form the base of the sinus. Since the species was described, large collections of this maple of the Edwards Plateau in western Texas show that this projection of the nerves is not a constant character and that *A. sinuosum* must be considered a small-leaved form of *A. saccharum*.

This little Texan tree is known only on the banks and bluffs of Cibelo Creek, near Boerne, Kendall County, on the rocky banks of the upper Seco Creek, Bandera County, and at the base of a high limestone bluff near Utopia, Uvalde County. Its isolation is remarkable and interesting, for none of the group of sugar maples grow nearer to the Edwards Plateau than *A. grandidentatum* Nuttall on the mountains in the extreme western part of Texas, *A. floridanum* Pax at Marshall, Harrison County, Texas, and *A. leucoderme* Small and *A. saccharum* var. *glaucum* Sargent in the Red River Valley in southern Arkansas.

ACER FLORIDANUM Pax.—*A. saccharinum* Elliott, Sk. **1**:450 (at least in part). 1821.

The range of this species can be extended northward from River Junction, Florida, which is the type station, through the Piedmont region of Georgia and the Carolinas to the banks of the Roanoke River, near Weldon, Halifax County, North Carolina, and to Dinwiddie County, southeastern Virginia (river banks and low wet woods near McKenney, *W. W. Ashe*). It is common in the neighborhood of Raleigh, Wake County, North Carolina, where it has been largely planted, and is the common and prevailing street tree.

Recent collections show that the variety of *A. floridanum* with villose-tomentose petioles and usually pubescent branchlets is not uncommon. It is the

Var. FILIPES Rehder, Sargent, Trees and Shrubs, **2**:255. 1913.—*A. brachypterum* Wooton and Stanley, Contrib. U.S. Nat. Herb. **16**: part 4, 146. 1913; **19**:411. 1915.

The type station of this variety is Columbus, Muscogee County, Georgia. It has also been collected in Georgia at Cuthbert, near Milledgeville, Mayfield, and on Shell Bluff on the Savannah River below Augusta, at River Junction, Florida, Calhoun Falls, South Carolina, in the streets of Raleigh, North Carolina, at Campbell, southeastern Missouri, and on the San Luis Mountains in southern New Mexico (*A. brachypterum*). This isolated New Mexican station far to the westward of the region usually occupied by *A. floridanum* is remarkable, but in the shape of the leaves, in their pubescence and in that of the petioles, pedicels, and branchlets, and in the length of the wings of the fruit, it appears identical with some of the specimens of the var. *filipes* from the southeastern states.

ACER RUBRUM Linn.—*A. carolinianum* Walter, Fl. Car. 251. 1888.—*A. stenocarpum* Britton in Britton and Shafer, N. Am. Trees 647, *fig. 598*. 1908.—The leaves of the red maple are usually green and glabrous or pubescent below early in the season, generally soon becoming glaucescent or glaucous below and glabrous or they are usually rather longer than broad, generally cordate or sometimes rounded at base, 3–5-lobed by acute sinuses with serrate lobes and slender glabrous petioles; in the autumn they turn scarlet on some trees and bright yellow on others. The flowers are red or yellowish green (var. *pallidiflorum* Pax). The fruit on different trees is red, yellow, or brownish. The branchlets and winter-buds are glabrous.

The red maple grows on the borders of streams, in wet swamps and in upland forests, occasionally on dry hills, and is found from Newfoundland to the banks of the Miami River in the extreme southern part of Florida, and westward to western Wisconsin, Minnesota, eastern Oklahoma, and to the neighborhood of Houston, Harris County, Texas.

A. stenocarpum Britton is based on a single small stunted tree growing on a dry hill of flint rock at Allenton, St. Louis County, Missouri, on which the samaras of the fruit vary in width up to 6 mm. This maple has been growing in the Arboretum for several years.

No other North American tree ranges through so many degrees of latitude as separate Newfoundland from southern Florida. In the shape of the leaves and in their pubescence, and in the size of the fruit, *A. rubrum* shows much variation. The extremes of these varieties have sometimes been considered species, but they are connected by so many intermediate forms that a better idea of the red maple can perhaps be obtained by treating it as a species with the following varieties:

ACER RUBRUM var. TOMENTOSUM Pax, Engler Bot. Jahrb. 7:182. 1886.—*A. Drummondii* Small, Fl. Southern U.S. 741 (insomuch as

relates to Georgia and Florida, not Hooker and Arnott). 1903.—This variety, which was based on trees cultivated in Europe, is distinguished by the close pale pubescence which covers the lower surface of the leaves during the season. The leaves are 5-lobed, cordate or rarely rounded at base, and the petioles are glabrous or slightly pubescent early in the season. The branchlets are usually glabrous and the winter-buds are pubescent.

I have seen specimens of this form of the red maple from Biltmore, North Carolina (Herb. Bilt. no. 116b), from the neighborhood of Augusta, Georgia, from the top of Flagstaff Mountain, Barclay, Alabama, Panther Burn, Sharkey County, Mississippi, Larissa, Cherokee County, Texas (*B. F. Bush*, May 1, 1909, no. 5579), near Page, Leflore County, Oklahoma (*G. W. Stevens*, no. 2617), and swamps near Little Rock, Pulaski County, Arkansas.

A specimen of this variety with pubescent branchlets and winter-buds, and slightly pubescent petioles, collected by *J. K. Small* at the Altamaha River Swamp, Liberty County, Georgia, in June 1895, and specimens collected by *Mohr* in April 1895 at Mount Vernon, Mobile County, Alabama, with broadly ovate, 3–5-lobed, slightly cordate leaves with pubescent petioles, fruit only 3.5 cm. long, and glabrous branchlets, serve to connect the variety *tomentosum* with

ACER RUBRUM var. DRUMMONDII Sarg.—The leaves of this tree are often broader than long, cordate at base, usually 5-lobed, with stouter midribs and veins than those of the other forms of *A. rubrum*. Until nearly fully grown the leaves are covered on the upper surface with scattered pale hairs and are clothed below with thick snow white tomentum which is more or less persistent during the season; the petioles are stouter than those of the other forms of the red maple, and are covered during the season with thick white tomentum similar to that on the under surface of the leaves. This gradually disappears and the petioles often become nearly glabrous in the autumn. The fruit, which ripens in early spring before or with the unfolding leaves, varies from 5 to 6 cm. in length.

This maple, which is a small tree usually not more than 10–12 m. high, inhabits deep river swamps often inundated through the year. It is distributed from the valley of the Hastchatchee River, Forrest County, southern Mississippi, through Louisiana to the valley of the Neches River, Texas (Beaumont and Concord). It is not rare in southern and eastern Arkansas, southeastern Missouri, and occurs in northwestern Mississippi (Morehead,

Sunflower County), and in southwestern Indiana (in a cypress swamp 18 miles west of Decker, Knox County, *C. C. Deam.*)

In the broad 3–5-lobed leaves cordate at base this maple is very distinct from other forms of *A. rubrum*, but trees occasionally occur with 3-lobed leaves rounded at base. This form may be described as

ACER RUBRUM var. DRUMMONDII f. **rotundata**, n. f.—Differing from the variety in the 3-lobed leaves rounded at base.

Specimens of this form have been collected in Louisiana at Chopin, Natchitoches Parish, *E. J. Palmer*, May 6, 1915 (no. 7553 type), and at Glen Gordon, Covington, St. Tammany Parish, *R. S. Cocks*, March 28, 1911; in Texas near Beaumont, Jefferson County, *C. S. Sargent*, April 11, 1915; and in Missouri at Poplar Bluff, Butler County, *G. W. Letterman*, September 3, 1882.

The fruit of this form has not been collected, but the tomentum of the leaves, petioles, and branchlets is that of the var. *Drummondii*. The shape of the leaves shows a transition into

ACER RUBRUM var. TRIDENS Wood.—*A. barbatum* Michaux, Fl. Bor. Am. 1:252 (at least insomuch as related to the leaves). 1803; Elliott, Sk. 1:451 (at least in part). 1821.—*A. carolinianum* Britton in Britton and Shafer, N. Am. Trees 648 (not Walter). 1813.—The leaves of this maple are obovate, narrowed from above the middle to the rounded or rarely cuneate base, 3-lobed at apex, coarsely serrate usually only above the middle, often ovate or oblong-ovate by the suppression of the lateral lobes, green or glaucous and glabrous, pubescent or tomentose on the lower surface. The flowers and fruit are red or yellow.

It has been found from Massachusetts to Florida, Missouri, and in eastern Texas to Harden and Cherokee counties, but is most abundant southward and sometimes, as in Richland Parish, northern Louisiana, it is the prevailing form.

The extreme forms of this variety are distinct, but the 3-lobed leaves often occur on trees with leaves of the normal form of the red maple, and the leaves on vigorous shoots of trees of this variety are often 5-lobed.

WALTER'S specimen of his *A. carolinianum* is preserved in the British Museum and is a typical *A. rubrum*, not the variety *tridens*. The leaves of *A. barbatum* as described by MICHAUX and ELLIOTT seem to be those of *A. rubrum* var. *tridens*. Their "pedunculi solito pilosi" might apply to *A. floridanum filipes* Rehder.

ACER NEGUNDO L.—The box elder or ash-leaved maple, which is one of the most widely distributed trees in the United States, has

assumed slightly different forms in different parts of the country. In what is considered the typical species, which occurs in the region east of the Rocky Mountains, the united part of the samaras of the fruit is more or less constricted at the base into a short stipe, and on the more western forms this constriction usually does not occur. This constriction and its absence, together with the absence or presence of pubescence on the leaves and branchlets, have sometimes been used to separate *A. Negundo* into several species, but the characters on which these species have been based are not particularly important, and it seems better to treat *A. Negundo* as a species with a number of varieties which often intergrade, for the characters on which they are based are not always constant.

In what is considered the typical species the branchlets are green and glabrous; the leaves are usually 3-foliate but occasionally 5–7-foliate; the leaflets are ovate to elliptic or oblong-obovate, acuminate and often long-pointed, rounded or cuneate and often unsymmetrical at base, coarsely and irregularly serrate usually only above the middle, and occasionally slightly lobed, slightly pubescent above and more or less tomentose below when they unfold, and at maturity glabrous above, usually villose-pubescent along the under side of the midribs and veins, and often furnished with conspicuous tufts of axillary hairs, otherwise glabrous or slightly pubescent below.

The typical form is distributed from western New England and central New York to Minnesota, Iowa, and Missouri, and southward to central Florida, northern Alabama, western Louisiana, and eastern Texas. I have not seen specimens of wild trees from eastern New England, eastern New York, New Jersey, or Delaware. The box elder is common along the St. Lawrence River near Montreal and in eastern Ontario, but these trees are believed to have been naturalized in recent years. As here considered it passes into the following varieties:

ACER NEGUNDO var. VIOLACEUM Kirchner in Kirchner and Petzold Arb. Mosc. 190. 1864.—*Rubac Nuttallii* Nieuwland, Am. Midd1. Nat. 2:137. 1911.—*Negundo Nuttallii* Rydberg, Bull. Torr. Bot. Club 40:55. 1913.—This variety is distinguished by its rather stouter, pale or bluish violet branchlets covered with a glaucous bloom, rather larger buds, and usually 3–7-foliate leaves

with slightly thicker, lanceolate to oblong-ovate or obovate, often entire or irregularly dentate, occasionally lobed leaflets, the terminal leaflet occasionally 3-lobed, glabrous above and usually slightly pubescent over the lower surface; the base of the fruit is usually but not always constricted.

This variety is distributed from western Massachusetts, through New York to Ohio, northern Wisconsin, Minnesota, Iowa, South Dakota, Dufferin, Manitoba, and Nez Perce County, Idaho; it is common in northern Missouri and occurs near Noel, McDonald County, in the extreme southwestern part of that state (*E. J. Palmer*, no. 5479).

ACER NEGUNDO var. TEXANUM Pax, Engler Bot. Jahrb. 7:212. 1886.—*A. californicum* var. *texanum* Pax, *l.c.* 11:75. 1890.—*Rubac texana* Small, Fl. Southern U.S. 743 (in part).—*Negundo texanum* Rydberg, Bull. Torr. Bot. Club 40:56. 1913.—This variety is best distinguished by the 3-foliate leaves with broader ovate to obovate, coarsely serrate leaflets cuneate or rounded at base and covered below through the season with loose pubescence. The branchlets are pale pubescent or tomentose during their first season and the body of the fruit is usually puberulous and slightly or not at all constricted at the base.

This variety occurs in western (Jackson County) and southwestern Missouri, northeastern Kansas, through Arkansas to western Oklahoma and to the valley of the San Antonio River, Texas. It appears to have been collected first by *Lindheimer* near New Braunfels, Texas, in 1843 (no. 360 in Herb. Gray). Eastward it passes into

ACER NEGUNDO var. TEXANUM f. **latifolium,** n. f.—*A. Negundo* var. *latifolium* Pax, Engler Bot. Jahrb. 11:75. 1890.—Only differing from typical var. *texanum* in its glabrous branchlets and usually glabrous fruit often slightly constricted at the base.

This form occurs in eastern Texas, southern Arkansas, Louisiana, in the valley of the Black River, eastern Mississippi, at Nashville, Tennessee, on the banks of the Catawba River near Marion, North Carolina, in Virginia, and southern Ohio.

ACER NEGUNDO var. **interior,** n. var.—*A. interior* Britton in Britton and Shafer, N. Am. Trees, 655, *fig. 608.* 1908.—?*A. Kingii* Britton, *l.c.* 1908.—*Rulac interior* Nieuwland, Am. Mid. Nat. 2:139. 1911.—*Negundo interius* Rydberg, Bull. Torr. Bot. Club

40:56. 1913.—*Rulac texana* Small, Fl. Southern U.S. 743 (in part). 1903.—This variety, the box elder of the Rocky Mountains, differs from the variety *texanum* only in its narrower and usually more acuminate and more irregularly serrate, often lobed leaflets usually covered below with a closer pubescence, and in the more pubescent or tomentose petioles and rachis.

It ranges from Manitoba, Saskatchewan, and Alberta southward through Wyoming, Montana, Colorado, Utah, New Mexico, and Arizona. The oldest specimen of this tree which I have seen was collected by *A. Fendler* in New Mexico in 1847 (no. 102 in Herb. Gray).

More distinct is the variety of Arizona and southern New Mexico, which may be described as

ACER NEGUNDO var. **arizonicum,** n. var.—Leaves thin, 3-foliolate; petioles slender, glabrous, 4.5–7 cm. in length, often turning bright red late in summer; leaflets oblong-ovate to rhombic, acuminate and long-pointed at apex, rounded or cuneate at base, coarsely serrate, often slightly lobed near the middle, glabrous at maturity with the exception of conspicuous tufts of axillary hairs, 6–10 cm. long and 3–5 cm. wide; petiolules slender, glabrous, usually bright red, those of the terminal leaflet 2–2.5 cm. in length, the others only 6–7 mm. long. Flowers not seen. Racemes of fruit glabrous, 8–10 cm. in length; body of the fruit spreading, glabrous, not constricted at the base.

A tree 7–8 m. high with light gray fissured bark and slender glabrous branchlets thickly covered with a glaucous bloom.

ARIZONA.—Cave Creek Canyon, east slope Chiricahua Mountains, *J. W. Toumey*, July 1894; Oak Creek Canyon near Flagstaff, Coconino County, *A. Rehder*, July 14, 1914 (no. 34); Sycamore Canyon near Flagstaff, *Percival Lowell*, October 1915 and 1916; Santa Catalina Mountains, *J. G. Lemmon*, May 1881 (no. 128 in Herb. Gray); Mount Kellogg, Santa Catalina Mountains, altitude 2700 m., *A. Rehder*, August 31, 1916 (no. 463 type).

NEW MEXICO.—Kelley's Ranch, 7 miles north of Alma, Socorro County, *A. Rehder*, August 13, 1914 (nos. 279, 280; growing near no. 281, with densely pubescent branchlets and leaflets pubescent below, and so referable to var. *interior*); Glenwood, 7 miles south of Alma, Socorro County, *A. Rehder*, August 14, 1914 (no. 300).

This is the most glabrous of the forms of *A. Negundo*, and in its thin leaflets, bright red petioles, and glabrous branchlets thickly covered with a glaucous bloom one of the most distinct of them all.

ACER NEGUNDO var. CALIFORNICUM Sargent, Garden and Forest, 4:148. 1891; Silva N. Am. 2:112. *pl.* 97. 1891.—*Negundo californicum* Torrey and Gray, Fl. N. Am. 1:250, 684. 1838; Rydberg, Bull. Torr. Bot. Club 40:56. 1913.—*Acer californicum* Dietrich, Syn. 2:1283. 1840; Pax, Engler Bot. Jahrb. 7:213 (in part). 1836; 11:75. 1890.—*Negundo aceroides* Torrey, Pacific R.R. Rep. 4:74 (not Moench). 1857.—*Negundo aceroides* var. *californicum* Sargent, Garden and Forest 2:364. 1889.—*Acer Negundo* subsp. *californicum* Wesmael, Bull. Soc. Bot. Belg. 29:43. 1890.—*Rulac californica* Nieuwland, Am. Mid. Nat. 2:139 (in part). 1911.—Leaves trifoliate with tomentose or nearly glabrous petioles, rachis, and petiolules; leaflets oblong-ovate to rhombic, acuminate and long-pointed at apex, cuneate or unsymmetrically rounded at base, coarsely serrate above the middle or nearly entire, occasionally deeply lobed, glabrous on the upper surface except along the midribs and veins, thickly coated on the lower surface with matted pale hairs and furnished with large axillary tufts. Fruit on pubescent pedicels, puberulous or nearly glabrous, not constricted or rarely slightly constricted at base.

A large tree with dark bark, hoary tomentose branchlets, and winter-buds.

Valley of the lower Sacramento River southward to San Bernardino County, California. The California box elder was discovered by DAVID DOUGLAS in 1833, probably in the neighborhood of Monterey.

FRAXINUS AMERICANA var. **subcoriacea,** n. var.—Differing from the type in its thicker, entire or slightly serrate leaflets, silvery white on the lower surface. Individual trees of *F. americana* occur with thick, oblong-ovate, acuminate, entire or slightly serrate leaflets dark green and lustrous above, silvery white below, glabrous or slightly villose along the midribs, and 7.5–13 cm. long. These trees are so distinct in appearance and in their more rapid and vigorous growth that it seems desirable to give them a varietal designation. What may be considered the type of the variety has been growing in the Arnold Arboretum since 1874, where it was raised from seed sent by *W. C. Hampton* from Mount Victory, Harding County, Ohio, as "*Fraxinus* C." The trees of this variety have grown more rapidly and are handsomer than any of the other American ashes in the collection. In 1910 and 1912 I collected the

same variety at Campbell, Dunklin County, Missouri, where I saw only a single individual. *F. americana* no. 4206, *A.* and *E. G. Heller*, Texarkana, Texas, September 1898, with entire and equally thick leaflets but not so pale below, is probably the same form.

CASTANEA ALNIFOLIA var. **floridana,** n. var.—Differing from the type in the glabrous, lustrous under surface of the mature leaves and in its arborescent habit.

In sandy soil with *Quercus myrtifolia* Willd. on the shores of St. Andrews Bay near Panama City, Bay County, Florida, *T. G. Harbison*, May 28, 1917 (no. 10, type), December 10, 1918 (nos. 13, 14); Dover, Screven County, Georgia, *T. G. Harbison*, May 13, 1913.

A tree occasionally 13–14 m. tall, or sometimes shrubby.

Unfortunately I have not seen the fruit of this tree, but in the shape of the leaves and in their serration, in the inflorescence, and in the glabrous branchlets it is not distinguishable from *C. alnifolia* Nutt. The leaves when they first unfold are hoary tomentose below, and the tomentum is sometimes persistent during the season on the upper leaves of vigorous shoots.

On a specimen of what appears to be the same form collected by *Harbison* near Jacksonville, Florida, the branchlets are slightly puberulous, and there are a few hairs on the under side of the midribs of the otherwise glabrous leaves.

The leaves of a shrub with pilose branchlets collected by *Harbison* on the coast near Wilmington, North Carolina, are broadly obovate and green, lustrous and puberulous on the under surface, and quite different from the leaves of the typical form of *C. alnifolia*, which are narrow-obovate to oblong-elliptic and thickly covered below with pale tomentum.

ARNOLD ARBORETUM
JAMAICA PLAIN, MASS.